

WHAT IS CLAIMED IS:

1. An assay plate comprising:
 - a substrate having a substrate surface;
 - at least one raised pad extending from said substrate surfaceand having a substantially planar sample receiving surface configured for holding a sample thereon for *in situ* experimentation.
2. The assay plate of claim 1, wherein:
 - a) said sample receiving surface has at least one sharp edge;
 - b) said raised pad comprises at least one sidewall coupling said sample receiving surface to said substrate surface;
 - c) said sample receiving surface shape is a circle, oval, square, rectangle, triangle, pentagon, hexagon, octagon, polygon, irregular, or any combination of the aforementioned;
 - d) said sample receiving surface is sized to hold a predetermined volume of sample;
 - e) said plate comprises an array of raised pads;
 - f) said sample receiving surface has a diameter of between 10 μ m and 1cm;
 - g) wherein a diameter of said sample receiving surface is larger than a height of a sidewall coupling said sample receiving surface to said substrate surface;
 - h) said substrate surface is substantially planar and level;
 - i) said raised pad and said substrate are integrally formed;
 - j) said raised pad is made from metal, steel, titanium, silicon, polymer, plastic, glass, quartz, ceramic, or any combination of the aforementioned;
 - k) said substrate is made from metal, steel, titanium, silicon, polymer, plastic, glass, quartz, ceramic, or any combination of the aforementioned;
 - l) an area around said raised pad is etched from said substrate;
 - m) wherein said raised pad and said substrate are etched, machined, injection molded or cast;
 - n) said assay plate further comprises at least one cavity in said substrate adjacent said raised pad;
 - o) said substrate surface is sloped;
 - p) wherein said plate further comprises at least one hole through said substrate;

- q) said substrate is flexible; or
- r) a roughness of said sample receiving surface is less than 5µm.

3. The assay plate of claim 2(b), wherein an angle between said sidewall
5 and said sample receiving surface is between 45 and 135 degrees.

4. The assay plate of claim 2(b), wherein an angle between said sidewall
and said sample receiving surface is approximately 90 degrees.

10 5. The assay plate of claim 2(e), further comprising an array of 24, 96,
384, or 1536 raised pads.

6. The assay plate of claim 5, wherein:
a) said sample receiving surface has a diameter of between 1 to
15 8.5mm for an assay plate having 96 raised pads;
b) said sample receiving surface has a diameter of between 0.5 to
4.2mm for an assay plate having 384 raised pads; or
c) said sample receiving surface has a diameter of between 0.05 to
2mm for an assay plate having 1536 raised pads.

20 7. An assay plate comprising multiple raised pads extending from an
substrate surface of a substrate, where each of said raised pads has a
substantially planar sample receiving surface configured for receiving a
sample thereon for *in situ* experimentation.

25 8. A method of using an assay plate, comprising:
providing a substrate with a raised pad extending from a surface
thereof, where said raised pad has a substantially planar sample
receiving surface configured for receiving a sample thereon;
30 depositing a sample on said raised pad;
performing an experiment using said sample on said raised pad.

9. The method of claim 8, further comprising drying said sample before
said performing an experiment.

35 10. The method of claim 9, further comprising, after said drying, depositing

a different sample on said raised pad and drying said different sample.

11. The method of claim 9, further comprising, after said drying,
redepositing said sample on said raised pad and redrying said sample.

5

12. The method of claim 8, wherein said depositing comprises depositing
an amount of sample on said pad sufficient to form a raised droplet without
substantially spilling off said sample receiving surface.

10 13. The method of claim 8, wherein said forming comprises etching a
material to form said substrate and said raised pad.

14. The method of claim 8, wherein said forming comprises injection
molding or casting said raised pad and said substrate.

15

15. The method of claim 8, further comprising overlaying said sample with
a membrane or tissue.